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STANFORD PROGRAM IN COMPUTER-ASSISTED INSTRUCTION, PROGRESS REPORT 6, FOR THE PERIOD JANUARY 1, 1967 TO MARCH 31, 1967.

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THIS REPORT DESCRIBES THE PROJECTS IN COMPUTER-ASSISTED INSTRUCTION CONDUCTED AT THE STANFORD LABORATORY FOR COMPUTER-ASSISTED LEARNING AND TEACHING AND AT THE STANFORD-BRENTWOOD COMPUTER-ASSISTED INSTRUCTION (CAI) LABORATORY. THE MAJOR ACTIVITIES, WHICH ARE REPORTED FOR THE PERIOD FROM JANUARY 1 THROUGH MARCH 31, 1967, ARE RELATED TO (1) READING AND MATHEMATICS AT BRENTWOOD, (2) A TELETYPE PROGRAM IN ELEMENTARY MATHEMATICS DRILL AND PRACTICE, (3) SYMBOLIC LOGIC AND MODERN ALGEBRA, AND (4) PRELIMINARY WORK ON AN ELEMENTARY RUSSIAN PROGRAM. A REPORT ON SYSTEMS AND OPERATIONS FOR BOTH THE STANFORD-BRENTWOOD 1500 SYSTEM AND THE STANFORD PDP-1 SYSTEM IS INCLUDED. THERE ARE ALSO A SPECIAL SECTION ON PROCEDURES FOR HANDLING VISITORS TO THE STANFORD-BRENTWOOD LABORATORY AND A REPORT ON VISITORS DURING THIS REPORTING PERIOD. (RP)

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PROGRESS REPORT 6

STANFORD PROGRAM IN COMPUTER-ASSISTED INSTRUCTION

FOR THE PERIOD

JANUARY 1, 1967 to MARCH 31, 1967

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SUMMARY

This report describes the projects in computer-assisted instruction conducted at the Stanford Laboratory for Computer-Assisted Learning and Teaching and at the Stanford-Brentwood CAI Laboratory, for the period from January 1, 1967 through March 31, 1967. The major activities during this time involved reading and mathematics at Brentwood; teletype programs in elementary mathematics drill and practice, symbolic logic, and modern algebra; and preliminary work on an elementary Russian program to begin operation in September, 1967. A current report on systems and operations for both the Stanford-Brentwood 1500 system and the Stanford PDP-1 system is included. There is also a special section on procedures for handling visitors to the Stanford-Brentwood Laboratory, and a report on visitors during this quarter. Activities planned for the period from April 1, 1967 through June 30, 1967 are described. Finally, a record of personnel changes during the first three months of 1967 is provided.

TABLE OF CONTENTS

1. Major Activities of the Reporting Period
   A. Reading at Brentwood
      Student progress
      Student use of system
      Lesson coding
      Lesson writing
      Evaluation
   B. Mathematics at Brentwood
      Terminal room procedure
      Programmed curriculum
      Classroom curriculum
   C. Teletype Drill and Practice in Elementary Mathematics
   D. Teletype Program in Symbolic Logic and Modern Algebra
   E. Elementary Russian
   F. Systems and Operations
      Stanford-Brentwood 1500 system
      Stanford PDP-1 system
2. Visitors at the Stanford-Brentwood Laboratory
3. Activities Planned for the Next Reporting Period
   A. Reading at Brentwood
   B. Mathematics at Brentwood
   C. Teletype Drill and Practice in Elementary Mathematics
   D. Teletype Program in Symbolic Logic and Modern Algebra
   E. Systems and Operations
      Stanford-Brentwood 1500 system
4. Personnel
   A. Reading at Brentwood
   B. Mathematics at Brentwood
   C. Systems and Operations
      Stanford-Brentwood 1500 system
      Stanford PDP-1 system

1. Major Activities of the Reporting Period

A. Reading at Brentwood

The activities of the reading project for this period were centered on: 1) continuing use of the 1500 system for reading instruction, 2) improvement of coding procedures to minimize audio response time, 3) coding and debugging of lessons in Levels III, IV, and V, 4) continuing production of lesson material in Levels VI, VII and VIII, and 5) increased efforts in data reduction (see section F, below).

Student progress. The range of the distribution of students over the lessons has continued to increase as shown in Table 1. The range was eight lessons at the beginning of this reporting period and 25 lessons at

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Insert Table 1 here

---

the end. The range is not easy to interpret since it reflects demographic movement in the student population. Four students transferred out and four transferred in. A more accurate description of the distribution is given in terms of the median and inter-decile range, shown in Figure 1. The latter increased from 3 lessons at the beginning to 14 lessons at the end of the period. The increasing spread of the students over the lesson material indicates that at least some of the individual differences in the learning characteristics of the student population are being accommodated in the curriculum.

Another interesting feature of the available data on student progress is reflected in a rate-of-progress curve, plotted for the fastest and slowest students in the original population. Figure 2 shows these results. The position of the student in the lesson material, as given in the weekly teacher's report, was plotted against the cumulative number of sessions the student had been at the terminal. The curves indicate that, at least for this reporting period, the rate of progress for the two extreme subjects is essentially linear; the curves differ only in slope.

Insert Figure 1 and 2 here

Student use of system. Plans were formulated for the addition of selected second-grade remedial reading students to the CAI classes.

Organizational difficulties and some fluctuation in system reliability postponed the introduction of the new students to the system until the last two days of this reporting period. Fourteen second-grade remedial reading students were brought to the terminal room on March 31. Their reactions and progress will be discussed in the next quarterly report.

Lesson coding. A major effort was made to allow the students to move through the lessons at a faster rate. The lesson code was revised to eliminate two hindrances to student progress observed the previous reporting period: restart points had been placed too far apart, and audio responses had been too slow. Revisions of the lesson code has been carried out in two stages. For Level II, interim macros were written to adjust the distance between restart points and to minimize audio delay by prepositioning for a CA audio while the student is responding. A second and final set of macros was written for use in Level III and beyond. These incorporated the revisions in the interim macros and also replaced the CA audio with a smiling face on the CRT. The word "no" in the WA audio was also replaced by a crying face. The use of smiling and crying faces allows the audio to be positioned to the next instructional message while the student is receiving visual reinforcement or feedback.

The above revisions were made in two steps because of the pressure of the students' progress on the lesson coding and debugging process. Taking a calculated risk that some students would temporarily run out of lesson material, we interrupted the progress of lesson coding to revise and debug new macros. The risk was minimized by the two-stage strategy; and the anticipated gains were judged to be important enough to justify the increased strain on the lesson coding process. The number of completely coded and debugged lessons beyond those in current use by students again reached a comfortable margin by the end of the reporting period. The probability of maintaining that margin until the end of the current school year is high.

Lesson writing. The production of lesson materials for Levels VI, VII and VIII has continued at a steady pace. Screening tests, which will allow students to skip over entire lessons, have been designed and written. They are now being validated by giving them to students off-line as they

Table 1

. Weekly Distribution of Students Over Reading Lessons

Lesson Number	Date	1/4	1/11	1/18	1/25	2/1	2/8	2/15	2/22	3/1	3/8	3/15	3/29
I	1	1	1	0	0	0	2*	2*	0	0	0	0	0
	2	5	4	1	1	0	0	0	3*	3*	2*	2*	1
	3	25	13	7	4	4	2	0	0	0	0	0	0
	4	14	12	12	6	3	3	5	4	2	1*	0	0
	5	1	13	11	16	11	7	5	1	3	4	4	0
	6	2	3	10	4	8	9	4	5	1	1	2	5
	7	1	0	4	7	9	9	8	6	5	3	1	1
	8	0	1	0	6	2	5	6	6	8	4	1	1
	9	1	2	0	1	5	2	8	9	6	12	8	4
	10		1	2	0	3	4	3	5	9	4	9	7
	11			2	4	0	4	1	1	2	4	1	5
	12					1	0	5	3	2	3	6	5
	13					3	0	0	2	2	4	2	3
II	1						1	0	2	3	1	2	2
	2						3	0	1	2	1	3	2
	3							4	0	0	2	1	2
	4								0	0	2	1	2
	5								4	3	0	3	1
	6									1	1	1	4
	7										2	2	1
	8										0	1	0
	9.1										1	0	2
	9.2											1	1
	10												0
	11												1
	12												
Total Number of Students		50	50	49	49	49	51	51	52	52	52	51	50

*New Students

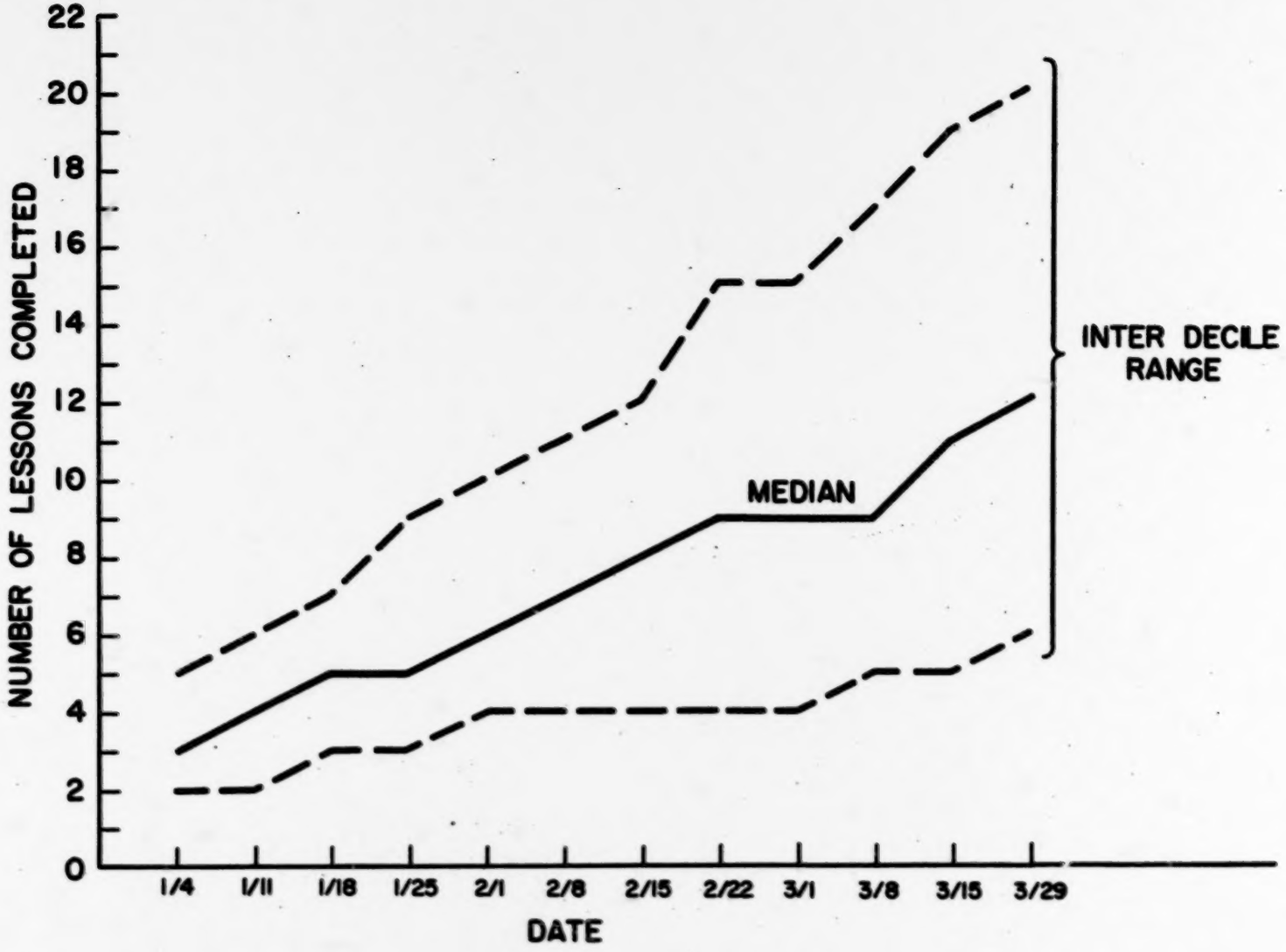

Figure 1. Cumulative number of reading lessons completed each week for current reporting period.

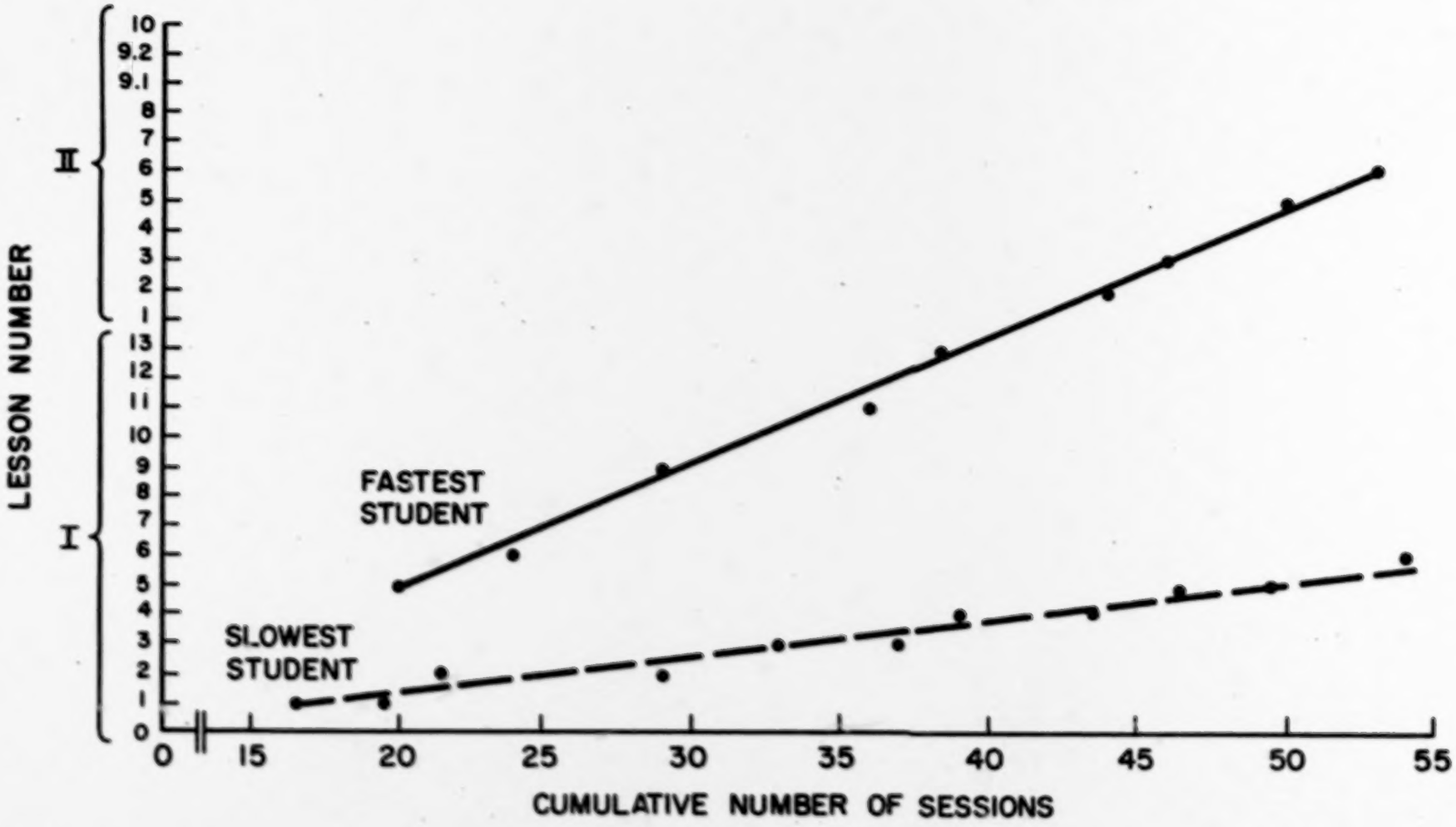

Figure 2. Position in reading curriculum by week plotted against cumulative number of sessions on system for fastest and slowest student in original student population.

transfer from lesson to lesson. No branching decisions will be made on the basis of the screening tests until the validation study is complete.

Evaluation. Formulation of plans for an extensive evaluation of student achievement was begun near the end of this reporting period. Control groups have been identified and the selection of standardized test and the design of appropriate sub-scales have been initiated. Detailed discussion of the tests and the results will form a major portion of the next quarterly report.

B. Mathematics at Brentwood

The children who receive CAI instruction in mathematics are continuing the schedule established in the fall; groups of twelve to sixteen pupils come for a period of 25 minutes every day. The students spent about half of their time on the programmed lessons and about half on the classroom work which was designed to accompany the programmed curriculum material. In order to make efficient use of computer time, student time, and proctoring personnel, the schedule usually allows all the children in one group to remain in the laboratory classroom for an entire period rather than spending part of each period in the terminal room and part in the classroom. Thus the laboratory classroom teacher can sometimes work with the children in the terminal room, and she can use the proctors as teaching aides when all children are in the classroom.

The population has continued to be relatively stable. There have been four withdrawals and four new enrollments since the beginning of the school year. The total enrollment was 50 on March 31.

Terminal room procedure. As in December, the terminal room staff consists of three proctors whose primary duty is to help individual children, and one proctor who is responsible for mechanical problems, including the changing of audio tapes whenever necessary. Between the half-hour periods all the proctors assist in signing on student stations, loading audio cartridges and film reels, and cleaning light pens and headsets. The proctors also write detailed comments about their interactions with the students and on the children's reactions to the programmed lessons.

In an effort to increase the efficiency of the proctors there were two slight changes in procedure: the proctor typewriter was moved into

the computer room and the use of the OFF ALL command was standardized. With the proctor station in the computer room, the automatic signal for a change of audio tape goes directly to the proctor, who can then change the appropriate tape without wasted motion. At the same time coding was changed to allow proctors handling calls to receive pertinent information from the student station itself about the child who needs help.

For the first part of the school year the students were signed off at the end of a period by the FADE ALL command, which allows each student to finish his current lesson before being signed off. Most students were signed off within three minutes of the time the FADE command was entered. However, there were frequently one or two students who worked so slowly or who had just started such lengthy lessons that they were not signed off for seven or eight minutes. The OFF ALL command, which signs off all students immediately, is now entered three minutes after the FADE ALL command. This procedure allows adequate time for tape and film changes, correction of minor hardware misfunctions and occasional disk pack changes and, at the same time, allows most children to work for a maximum length of time.

Programmed curriculum. By January 1 most children were doing lessons on numeral recognition, counting and N-notation. A few children had had an introduction to addition (Book 7) and a few were still finishing the lessons on set union. By the end of March most children had finished the introduction to addition, lessons on sequences, an introduction to the number line, sums through nine, and lessons on open and closed figures, concave and convex figures, and linear measure. They were beginning the problems which required the student to supply missing addends. A few children had finished the missing addend problems as well as some lessons on number words. The progress of the children through the programmed curriculum is shown in Table 2.

Insert Table 2 here

Because of severe learning difficulties caused partly by emotional problems and partly by inadequate preparation for first-grade mathematics,

Table 2

Student Progress in Programmed Mathematics Curriculum

	Jan 3-6	Jan 9-13	Jan 16-20[1]	Jan 23-27	Jan 30-Feb 3	Feb 6-10	Feb 13-17	Mar 20-24	Feb 27-Mar 3	Mar 6-10	Mar 13-17	Mar 20-24[2]	Mar 27-31
Book 4	4												
Book 5	13	5	1										
Book 6A	17	6	5	5	1								
Book 6B	9	9	3	1	4	2							
Book 6C	1	12	9	6	5	5	4	4	4	4	4	4	4
Book 7A	4	11	15	14	3	5	5	4	4	4	4	4	4
Book 7B	2	2	10	9	14	5	5	3	3	3	3	3	3
Book 8		2	3	10	12	11	4	5	1	1	1	1	1
Book 9A		3		1	4	9	11	2	4	1			
Book 10			4	2	5	6	9	11	3	2			
Book 9B				2	2	7	4	9	5	2	2	2	
Book 14A							8	12	20	22	12	12	10
Book 14B									6	2	10	10	2
Book 15A										6	6	6	12
Book 15B										3	7	7	7
Book 16A											1	1	7

1. One student left the school; one new student was enrolled (starting in Book 6).

2. Spring vacation, March 20 - March 24.

a small number of children were given special instruction by the laboratory classroom teacher. These children are now ready to continue with the programmed lessons.

General systems failures have been rare. On January 5 one group was unable to work on the machines because of a systems error; on February 21 a parity error occurred and one group of children returned to the classroom after eight minutes on line. Throughout January, due to the widening span of students within groups and the limitations at that time of the course pack program, a few of the faster students were occasionally taken off-line. They remained in the classroom until the gap between them and the slowest child in their group had decreased sufficiently to allow them to continue.

The children continue to respond enthusiastically to computer-assisted instruction. Their respect for the machine increases with their understanding of how it works. They were recently allowed to visit the computer room and observed processes of audio tape changing the disk pack loading. However, they still derive their greatest pleasure from their own manipulation of the machine resources. Thus the introduction of the procedure allowing them to type one answer created great excitement and, in some cases, improved performance.

Children are becoming more and more aware of their own progress, regardless of their standing in the class. Children are less apt to compare themselves with others, but see their accomplishments in terms of the ratio of sad and happy faces.

Programmed material is designed to make it virtually impossible for a child to sit and do nothing while at his terminal. Proctors noted that some students who worked at an average pace while in the terminal room would complete only a few problems when given a work sheet in the classroom, unless a teacher was with them every minute.

Immediate correction of a child's error seems to be an effective teaching device, as does the reinforcement of correct responses. This fact was made apparent in the classroom when the children requested a "happy face" for each problem they had done correctly.

Classroom curriculum. The role of the laboratory classroom teacher remained essentially unchanged. Readiness exercises which require manipulative experiences, such as counting, are confined to the classroom. Applications of mathematics which require the children to use concrete objects such as measuring devices are also limited to classroom situations. Group interaction and verbalization constitute a large part of the classroom work. Writing skills, including writing numerals and equations, are developed in the classroom also.

In January children began readiness work in measuring in preparation for measuring lessons on the machines. They first measured objects in the room with popsicle sticks and one-inch cubes; later they found the length of sides of figures with rulers.

As the majority of the children reached the programmed lessons on addition, the classroom teacher began introducing specific counting algorithms for addition using beads strung on heavy wires: These beads were then made available to the children when they are working in the terminal room. Oral reading of equations and writing equations were also done in the classroom. Work sheets of various kinds were provided for the children as needed. Readiness for addition on the number line was given, largely in the form of "number line" games.

Enrichment activities were provided for the brighter children. Several of these children were introduced to constructive geometry, using the exercises from Geometry for the Primary Grades by Newton Hawley and Patrick Suppes. Games for teaching mathematics, such as those devised by Z. Dienes, were also used.

For the students who needed remedial activities there were exercises designed to increase their understanding of basic number properties such as conservation of number, cardinality and order relations. Extensive work in numeral recognition and readiness for addition was also given to these children.

C. Teletype Drill and Practice in Elementary Mathematics

Over 90 per cent of the users of the PDP-1 system are participants in the teletype drill-and-practice program in elementary mathematics. (The total number of users are shown for each day in Figure 3 below.) Two

classes of fourth-grade students at an elementary school in Morehead, Kentucky are now running daily on a program of arithmetic drill. Grant School in Cupertino and Walter Hays School in Palo Alto are participating in drill-and-practice programs in arithmetic for third through sixth grades. An arithmetic drill program for first and second graders is carried on at Oak Knoll School in Menlo Park, while a program for grades two through six is in progress at Clifford School in Redwood City. Ravenswood High School in East Palo Alto is continuing its ninth-grade arithmetic drill program.

D. Teletype Program in Symbolic Logic and Modern Algebra

The teletype program in symbolic logic aims at developing computer-assisted programmed materials for presentation without additional classroom instruction. Brief instructions are typed out for the student; then derivations are presented for him to carry out. For the first lessons, the sole response mode programmed was for the student to type in abbreviated rule names and the numbers of the lines to which the rules were applied. The machine responded by typing the result of applying the rule, or it typed out an error message if the rule could not validly be applied. A trained logician was present to give on-line individual help as needed. This help was standardized as much as possible, and any instructions given were recorded.

During this reporting period, one class of selected fourth graders at Walter Hays Elementary School ran on a logic-algebra program, in addition to their participation in the mathematics drill-and-practice sessions. The 31 students involved worked on the logic-algebra program for six to ten minutes daily. Materials were developed a week or more in advance of the fastest student. Difficulties with software and hardware facilities did not permit simultaneous operation of more than five or six terminals until March. Beginning late in January, the students received sentential logic and algebraic derivations on alternate days.

It was soon apparent that the students were heavily dependent on on-line help given individually by the logician who was present. Additional modes of presentation, such as audio, or additional response modes, were needed. By the end of March, our programmer had increased the

response mode to include multiple-choice answers. This made vocabulary and strategy discussions possible and helped reinforce the reading of instructions.

Table 3 shows the mean number of problems, mainly proofs, completed in logic and algebra during this reporting period, as well as the range of number of problems completed.

Insert Table 3 here

During this reporting period, two special groups were included in the logic-algebra program. One group of ten sixth graders at Walter Hays School was on the teletypes for about 10 minutes once a week. They received no classroom instruction and no on-line assistance. Results for this group showed that the program is not yet fully self-administrating. Students progressed very slowly, seemed to be making random commands, and received many error messages.

The second special group consisted of 35 fifth and sixth graders from Fremont Hills Elementary School in Los Altos, California. These students were receiving classroom instruction in logic and algebra, so the teletype work was review work for them. They came to Walter Hays School in groups of eight, one afternoon a week. Thus each student came about once a month. On each visit the student was at the teletype for about 50 minutes. These students progressed rapidly from about one problem in two minutes to better than one problem per minute.

E. Elementary Russian

Programming on the Russian program is well under way. The first on-line pilot runs are now in progress. A special keyboard and printer mechanism for the Russian program has been designed. Increased efforts to obtain a reliable system have proved quite fruitful. The program will be used in two sections of beginning Russian at Stanford University starting in September, 1967. The program will provide all instruction, except for weekly pronunciation drill with a teacher.

F. Systems and Operations

Stanford-Brentwood 1500 system. At the beginning of this reporting period we were able to use only one course disk pack at a time with the

Table 3

Mean Number of Problems Completed in
Symbolic Logic and Modern Algebra

	Mean	Range
Logic	161	96-210
Algebra	100	57-154
Total	261	161-347

operating system. This was due to a bug which made the system run exceptionally slowly with more than one course pack on-line. During January, however, we received a fix for the operating system, allowing any number of course packs. The fix increased system efficiency in two ways: first, it yielded much greater course capacity to the system; and, second, it enabled us to start using our system of automatic course pack make-up. The course pack make-up is performed each night by a program which determines what lessons the students need for the next day and then loads the appropriate courses from a master tape to the student running course packs.

Two of our disk drives share a data channel, making it impossible to use both simultaneously. When IBM delivered a new, updated version of the operating system in March, we learned that the patch allowing operation of the shared-channel drives was not included. In fact, it had been removed in January with the installation of the multiple course pack fix. This fact immediately explained several previously unexplained problems. We requested and received a temporary version of the shared-channel patch. Negotiations are now under way for the acquisition of an additional data channel to eliminate the shared-channel problem.

In January a daytime computer operator was added to the staff. Her job is to set up the system during student sessions to allow the proctors time for more student-oriented tasks. Also she does all the audio tape duplication which was previously done at night. This allows both more production at night and faster response to audio duplication requests. In addition, this programmer has taken over much of the control card keypunching which had been done at night, further increasing the efficiency of our operation.

During February operations were hampered by a rash of parity errors. Tracing the problem proved to be a somewhat long and difficult task. In early March it was determined that one core block was bad. It was replaced and operations returned to normal.

During this reporting period, daily and weekly reports both for classroom teachers and project proctors were introduced. We can now report on any subset of student response data from the totality of responses recorded from the very first day of operation to the present. This reporting

generally takes the form of summaries and/or interpretations of student responses. The content, format, and the number of reports is in a constant state of flux because we must meet the informational feedback requirements of the classroom teachers, project proctors, Coursewriter II programmers, and project staff.

The data reduction group has also created a number of statistical tools for future informational feedback needs. These tools include descriptive statistics, such as minimums, maximums, means, and standard deviations. In addition, there is a multilinear regression analysis program which will be helpful in future data analysis.

Stanford PDP-1 system. Magnetic tape drives and control unit were installed and are working through a standard interface. Subsequently a special interface has been designed and installed, and is in the final debugging states. It will allow efficient use of the tape drives during general time-sharing activities. An acoustic coupler has been built and is in the final debugging stages. This device allows a teletype to be directly coupled to the PDP through an ordinary telephone.

Two PDP-8-680 communication systems were ordered for delivery in May, 1967. These systems will allow for a total of 80 teletypes in one line to the PDP-1. Thirty-two of these teletypes will be located in Kentucky. Forty-six additional teletypes have been ordered for delivery in May and June, 1967.

The first batch of data-analysis reports has been completed and large production runs are being scheduled. Mean time between failures is now in excess of several hundred hours.

Figure 3 shows the number of students run daily on the PDP-1 system, for the 58 days of operation between January 1 and March 31, 1967. On most days, between 700 and 900 students ran. On all but three days, the number of users was above 600. The greatest number of students, 934, ran on March 31; the smallest number, 229, ran on January 24.

Insert Figure 3 here

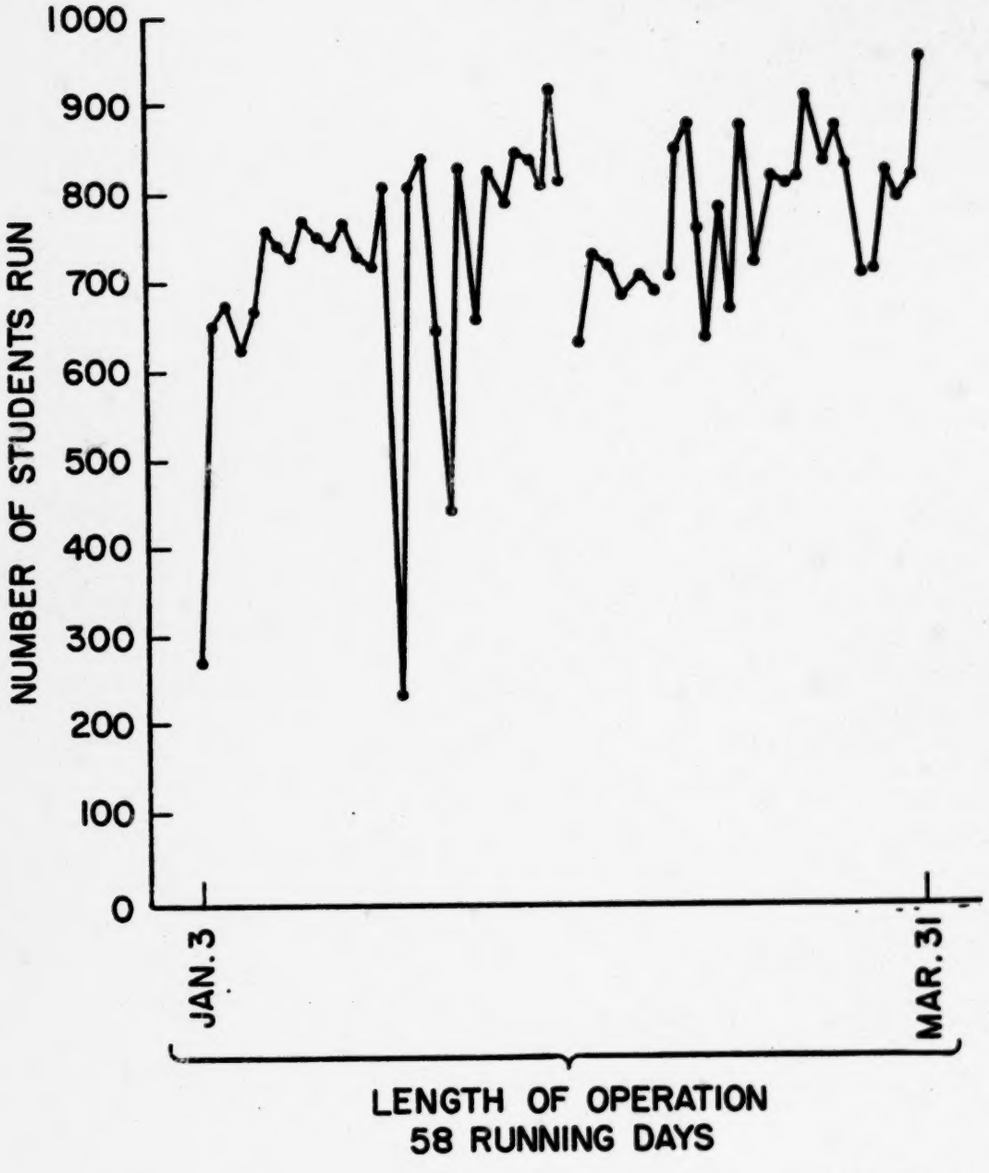

Figure 3. Number of students run daily on PDP-1 drill-and-practice system.

2. Visitors at the Stanford-Brentwood Laboratory

The number of visitors to the Stanford-Brentwood CAI Laboratory during the reporting period from January 1 to March 31, 1967 has clearly demonstrated the burgeoning awareness of this project by the public, professional educators, corporate executives, and news media throughout the nation and world. Project attempts to work with both the interests of individual visitors and those of large groups have strained the available resource personnel and facilities. The Project has found it necessary to pre-schedule all visitors to the Laboratory due to the limited viewing area and the increasing numbers of requests to visit.

At times, as long as three weeks has been required for scheduling of visitors, because of the large numbers of requests and the special requirements of visitors. The Project deems it necessary that each visitor to the Laboratory be given an ample opportunity to view the operation of the facility and to interact with its staff concerning the Project. The Project staff's desire to insure good communication of its operation and the program with Brentwood School has forced close adherence to a policy of limiting the number of visitors at any one time to that which can be comfortably accommodated by the Laboratory's resource personnel.

Extenuating circumstances requiring special attention for particular visitors and groups has been on a steady increase throughout this reporting period. Each special request has added to present problems of insuring good communication and reporting of the Stanford-Brentwood CAI program. As a result of these special requests, the Laboratory has had visitors during all hours of the normal eight-hour day, during noon hours, in the evening, and on all days of the week.

Much use has been made of a special low priority "extra" terminal unit located in an area where the normal Laboratory operation is disturbed only to a limited degree. A recent addition to this special terminal has been a loudspeaker audio output which allows a small group to observe the terminal's operation. This terminal has continued to be available for visitors' use only if its component parts are not needed to insure optimal operation of the program for children. The lesson material on this visitor terminal is the same as that available to the students.

Systematic records have been kept concerning those who have visited the Laboratory during this reporting period. Our records can identify 915 visitors to the Stanford-Brentwood CAI Laboratory during the reporting period from January 1 to March 31, 1967. Although these records are incomplete, this number represents more than double the number of visitors (440) who came to the Laboratory during the previous six months.

Much of the success in being able to accommodate this increased number of visitors has been due to the establishing of better routines, close cooperation by Project staff members, and pre-scheduling.

The diverse backgrounds of those visiting during this reporting period are best illustrated by the following classification of visitors.

Public school personnel: Elementary- and secondary-school superintendents, principals, teachers, consultants, etc. (223)

Students: Elementary, secondary, and college. (174)

Colleges and universities: Presidents, administrators, professors, research specialists. (168)

Corporations, companies, industrial firms, etc. (166)

State and County Education Departments: Superintendents, consultants, research specialists. (34)

Parents, interested citizens. (31)

Governmental Agencies: USOE, Bureau of Indian Affairs, PACE, Job Corps, NIH, NSF, Regional Laboratories, Military. (23)

Associations, clubs, foundations: Ford, National Education Association, American Association of University Women, etc. (18)

Correspondents and news media, both foreign and domestic.* (17)

Publishers: Presidents, executive staff members, sales representatives, editors, research specialists. (14)

Foreign Governmental Education Offices and Agencies. (12)

School board members and their committees. (11)

Consultants to education and educational research agencies. (11)

Private and parochial elementary and secondary school staff members. (9)

Some of the publications which have included articles mentioning the Stanford-Brentwood CAI Laboratory are: Saturday Review, Life Magazine, Phi Delta Kappan, NEA Journal, School Product News, and numerous newspapers both domestic and foreign.

Visitors to the Laboratory have come from all sections of the United States including Hawaii, Puerto Rico, and the Virgin Islands. Foreign visitors who have seen the Laboratory during this reporting period have come from: Belgium, Brazil, Canada, France, Finland, Hong Kong, Italy, Japan, Philippines, Switzerland, Thailand, United Kingdom, and Yugoslavia.

Over 25 special interest groups have arranged visits to the Laboratory. These groups range from national foundations and large corporate special educational projects, associations, and clubs, to educational and computer science classes from various colleges and universities (undergraduate,

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*This category represents The Ravenswood Post (East Palo Alto, California), London Financial Times (United Kingdom), IBM-World Trade, The Times (London, United Kingdom), Messaggero (Rome, Italy), Agence France Presse (France), American Broadcasting Company (National), British Broadcasting Company (United Kingdom), Finnish Broadcasting Company (Finland), West German TV-ZDF (West Germany), KWUN Radio (Concord, California) and the United States Information Agency - Motion Pictures and TV.

graduate, and extension). As much as possible, the special interests of each individual and group here been discussed during their visit to the Laboratory. As from the beginning of the Project, these interests continue to be very broad and inclusive of every operational aspect of the program. There are an increasing number of inquiries concerning the future of computer-assisted instruction.

3. Activities Planned for the Next Reporting Period

A. Reading at Brentwood

Curriculum development, coding, art work, audio recording, and debugging of lesson material will continue during the next reporting period. An extensive year-end evaluation program will be carried out. The first of a series of major statistical reports will be compiled and made available.

B. Mathematics at Brentwood

Coding, art work, audio recording and debugging of first-grade mathematics lessons will continue. Curriculum design and writing for second-grade material is now in progress and will be a major effort during the next reporting period; art work, coding and audio recording for second grade will begin during the next few months. Analysis of data and planning for the operation of the Laboratory during the 1967-68 school year will also continue. The Laboratory will be in operation for students through June 9.

C. Teletype Drill and Practice in Elementary Mathematics

Beginning in April, 13 classes from grades one through six will take part in the arithmetic drill-and-practice program in Morehead, Kentucky. On June 19, 28 teletypes will begin operation in Kentucky, for an eight-week program of arithmetic drill and practice. In addition, two teletypes will be used in the summer session at Roosevelt Junior High School in San Jose, California, starting June 29. This program will provide arithemtic drill and practice for grades five, six, and nine.

D. Teletype Program in Symbolic Logic and Modern Algebra

During the next reporting period, lessons will be written to make extensive use of the multiple-choice response mode. Also, the sentential

and algebraic deductions will gradually be converged, so that the same problem will involve both sentential and algebraic rules of deduction. Also, the amount of on-line individual help offered will be sharply reduced.

E. Systems and Operations

Stanford-Brentwood 1500 systems. We will continue to make improvements on the daily and weekly reports. Several special reports will be created containing more descriptive statistical information.

4. Personnel

A. Reading at Brentwood

Mrs. Candy Simonen resigned her position as Senior Lesson Programmer to accompany her husband to a physics research post in Germany. Mrs. Susan Haller was promoted to Senior Lesson Programmer. Mrs. Haller brings to her new duties nearly two years of experience on this project as a lesson programmer.

Miss Mary Snow was hired as a lesson programmer. Miss Snow comes to us with an excellent background of course work in computer programming and has been a teaching assistant in programming classes at Foothill College. Toby Steers and Robert Hirsch have been added to the staff as lesson coders.

Mrs. Venetia Johnson, a masters candidate in the Creative Writing Division of the Stanford English Department, has joined the writing staff. Mrs. Johnson is responsible for the production and editing of the fiction material which forms a part of each lesson.

B. Mathematics at Brentwood

Ann Matthias and Gil Johnson have joined the staff as full-time coders.

C. Systems and Operations

Stanford-Brentwood 1500 system. Miss Lea Byrd has joined the staff as a data-reduction programmer. In January Miss Kathy Speer joined our staff as the day shift computer operator. Near the end of March Mr. Gilbert A. Smith, graveyard shift computer operator, resigned. We therefore end this quarter seeking his replacement.

Stanford PDP-1 system. Mrs. Jan Stone joined the staff as a part-time computer programmer.